



PSYCHE.

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Notes on Luminous Larvæ of Elateridae.

On the 30th of June, 1873, I received from Dr. G. F. Waters, of Newton Centre, Mass., four luminous larvæ of Coleoptera, accompanied by a note informing me that he had found similar larvæ in Newton, in June, for the past eight years. These larvæ appeared in daylight of a yellowish color. Dr. Waters said further in his note, "Mr. F. F. Bush, of Weston, brought me some from near his residence once, which were quite dark brown to black on the unlight parts. I hear that they have been seen also in Milton. I know of no other locality where they are to be found. Mr. Bush said they are to be 'found in great abundance on all dark nights.' I have always found them under or near pine trees, and Mr. Bush's locality is so situated. . . . These were climbing grass and holding high their lights, as though looking for their loves. I have never been able to keep them alive more than five or six days." Subsequently Dr. Waters wrote: "Saturday evening [5 July], I took cars to Auburndale, and then walked two or three miles into Weston. I arrived at the locality just at dusk, and passed it without seeing anything but fire-flies; on returning I met some boys in a wagon, who had given me directions and then followed as soon as they could 'hitch up.' Knowing where they had been previously found, they, in following me, got two *very large* and *full* and gave them to me. Last evening [6 July] I went out for a walk and took my known locality and collected *nine*, mostly small." On the 9th of July I received from Dr. Waters ten of these larvæ, one of which was dead. On the evening of the same day I made a diligent search under the pine trees of "Norton's Woods," near the Museum of Comparative Zoology, Cambridge, but found none. On the night of the 16th of July,

I went with Dr. Waters to Pleasant Street in Newton, on the grounds of Mr. Davis, of the firm of Hallett & Davis, piano-forte makers, near the Cochituate Aqueduct, where we found thirty-four more, one of which was black. We did not get upon the ground till 9 o'clock, P. M., or later, when it was quite dark and moonless. The larvæ seemed to be still emerging from the ground, as after taking all I could find at one time in a place I afterwards found more there. These larvæ shine with a bright light from their spiracles and the membrane between the rings, which discovers them at a distance of some rods. I found them mostly near the roots of the grass, under or near an evergreen hedge and also a "buck-thorn" hedge, but some at a considerable distance from the hedge, in an orchard. Dr. Waters found some under pine trees on a high knoll near by. The whole locality was rather high and dry, no dew being on the ground, nor had there been a dew for several weeks. No larvæ were found near the brook which runs by the orchard.

On the evening of the 28th of July we went with two friends to the same locality in Newton where we had found the thirty-four larvæ. There, and on the lane entering Homer Street opposite Mr. E. F. Waters', and on the side of Centre Street, we found twenty more larvæ, four of which were quite black; the others yellow. All were on the average smaller than those got before; the black ones nearly of the same size with each other.

On the evening of the 29th of July, I obtained permission to examine the grounds of Mr. J. R. Lowell, near Mt. Auburn, in Cambridge. There, under or near pine trees, I caught thirty more larvæ, fourteen of which were black, the rest yellow.

On the evening of the 6th of August I hunted long and diligently for more of these larvæ in Mr. Lowell's grounds, but found none.

Thus in one month we found eighty yellow and nineteen black luminous Coleopterous larvæ. Some of these afterwards escaped, some I preserved in alcohol, some died of unknown causes, but on the 2d of August I had forty-eight living yellow ones and eighteen living black ones in my jars of earth. The last of these died in November, none of them having pupated.

Since the occurrences narrated above, I have made many inquiries about similar larvæ, and, have only learned that Mr. Sanborn found three or four larvæ apparently identical with one of the above, by the roadside between West Roxbury and Dedham. The first he had seen were brought him in 1862, by E. S. Rand, Jr., who found them in Dedham.

The most abundant form of these larvæ differs so little from "the third species" of unknown larvæ described by Osten-Sacken in vol. i of the Proceedings of the Entomological Society of Philadelphia, p. 129, that I think it sufficient only to describe the differences.

This is No. 3074 of my collection. It is 35 mm. long, elongated, with the first five rings behind the small head successively widening, the last three rings almost insensibly narrowing, the last ring evenly rounded; of a soft-leathery consistence. Lateral margins of all the abdominal segments and sometimes of the thoracic ones, the whole venter, and sometimes also the front and hind margins of the thoracic segments yellowish. Head retractile, well exerted when in walking, transverse, dilated medially behind, dark brown or almost black, sometimes paler on the margins. Anterior margin of the head above between the bases of the mandibles bisinuated, the forward projections of the curve being lateral, and the hollow central and broader. Below, directly over the mouth, the margin is truncate, centrally notched. No separate clypeus or labrum distinguishable. Third joint of antennæ cylindrical, twice as long as broad, one-third as long as the second joint, with no trace of a fourth joint in most cases. Mandibles strongly curved, either one outermost. So-called "second appendage" of the maxillæ indistinguishable. Third and fourth joints of maxillary palpi usually at least as long as they are broad.

Prothorax, when extended, as broad anteriorly as the head, longitudinal, posteriorly twice as broad as the head. Mesothorax and metathorax nearly equal in length, the latter a little longer; each shorter than prothorax. Punctuation of the thorax almost none. Tips of coxæ not very approximate, the posterior ones less approximate. Hind legs not much larger than the others and having about the same proportions. All the

legs spiny and bristly, but with no complete rings of spines. Abdominal segments not very different in length, but their relative lengths not very definite. Pseudopod a flattened truncated cone, of homogeneous fleshy texture; exsertile tip bituberculate or bifurcate.

No. 3075 of my collection, one specimen, is the dead larva given me by Dr. Waters, July 9. Dr. Waters assured me that all the larvæ in this lot were luminous, and as they were collected in the evening, they must have been so, yet this larva has a broader head actually and proportionally, short stout mandibles dilated and bent at a right angle in the middle, maxillary palpi not tapering, short and stout, rounded at the end, the third and fourth joints forming a mass of oval outline three times as long as either the first or second; the labial palpi short and stout, approximate; and other differences which I will not dwell upon with my present material.

The black larvæ make a third form, of which I find no specimens preserved in my collection, and did not take a particular description. They differ markedly in being able or apt to extinguish their light at times, which none of the yellow larvæ did, and then to resume it. They are much more active than the others, and smaller.

What else I have to say refers to the first larvæ described. They are quite active, and I should judge from the structure of their jaws that they are carnivorous. I did not succeed in feeding them with meat, earthworms, slugs, larvæ, leaves, nor slices of potato. They were in the habit of descending below the surface of the ground in the daytime, or sometimes remaining coiled up on the surface. Numbers congregated in the day time under a piece of tin or a slice of potato. They generally formed passages in the earth, with chambers, in which they rested singly. At night they moved about upon the surface. I did not determine whether artificial darkness would arouse them in the daytime. At night they were attracted to the side of the jar nearest artificial light. When disturbed, they roll themselves up with the head applied to the ventral surface of about the sixth ring, and with the terminal segment reaching the back of about the third ring; the head is then withdrawn

almost entirely within the prothorax, so that at most the mandibles, tip of mentum and palpi project beyond the prothorax. When picked up, they give quite a cold sensation to the touch. Sometimes they emit a blackish fluid from the mouth, in the manner of locusts. Erroneously, according to the claims of priority, although the error is more appropriate than the truth, they are commonly called "glow-worms." By the suggestion and indications of Mr. E. P. Austin, I conjecture that they are the larvæ of *Asaphes memnonius*. *B. Pickman Mann.*

The Note of the Katydid.

Since I began to study the character of the notes produced by different species of Orthoptera, it has been my fortune to hear that of the true Katydid (*Cyrtophyllus concavus*) but once. This insect lives in tree tops, one or two only in a tree, in little colonies scattered here and there over most of the United States east of the Rocky Mts. One such colony I encountered in the heart of the city of Springfield, Mass., and spent an evening endeavoring to reduce the notes to scale. The insects which I observed were from fifteen to twenty rods distant, perched in the tops of maple, cherry and elm trees, not far above my window.



They ordinarily call "Katy," or say "she did," rather than "Katy did"; that is, they rasp their fore wings twice, more frequently than thrice; these two notes are of equal (and extraordinary) emphasis, the latter about one quarter longer than the former; or, if three notes are given, the first and second are alike and a little shorter than the last; the notes are repeated at the rate of two hundred per minute; and while the interval between two series of notes varies to a certain degree, it is seldom greater than two and one-third seconds, or less than a second and a quarter; usually it is between one and seven-eighths and two seconds. The accompanying cut, in which each bar represents a second of time, attempts to reduce this to a scale.